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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,525	02/23/2004	Richard C. Ruby	10031094-1	1569

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AGILENT TECHNOLOGIES, INC.  
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EXAMINER

SUMMONS, BARBARA

ART UNIT	PAPER NUMBER
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2817

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/785,525

Applicant(s)

RUBY ET AL.

Examiner

Barbara Summons

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10, 12-19 and 22 is/are rejected.
- 7) ☒ Claim(s) 8, 9, 11, 20, 21 and 23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/23/04 &amp; 6/3/05</u> | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of the invention of Group I in the reply filed on August 3, 2005, as well as the cancellation of the non-elected claims (i.e. claims 24 and 25), is acknowledged.

### *Drawings*

2. The drawings are objected to because in Fig. 4, the reference sign for the resonator under 12a should be changed from "26" to - - 22 - - because it is shunt resonator 22 that is under series resonator 12a (see the spec. at page 7, lines 13-16), while the shunt resonator 26 is under series resonator 16a as correctly labeled on the right-hand side of the figure.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: reference sign "10b" mentioned in the description at section [0034]. It appears that in Fig. 7, reference sign "10" should be changed to - - 10b - -.

4. The drawings are objected to because in Fig. 8, reference sign "22b" should be changed to - - 22 - - in order to be consistent with the specification and Fig. 7 (see section [0036]).

5. Corrected drawing sheets addressing the three problems above and in compliance with 37 CFR 1.121(d), are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should

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include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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7. Claims 1-7, 10, 13 and 15 are rejected under 35 U.S.C. §§ 102(a) and 102(e) as being anticipated by Barber et al. U.S. 6,635,519.

Regarding claims 1, 2, 5 and 13, Fig. 6 of Barber et al. discloses an apparatus comprising: a first lower acoustic resonator being a film bulk acoustic resonator (FBAR) that has a piezoelectric layer 19 sandwiched by a bottom electrode 18 and a top electrode 20 (see also e.g. Fig. 3 and col. 2, lines 60-62), the first/lower FBAR being on a substrate 10; and a second upper FBAR having a piezoelectric layer 19' sandwiched by bottom and top electrodes 18' and 20', the second/upper FBAR being above the first/lower FBAR; and wherein the second/upper FBAR is vertically separated and decoupled from the first/lower FBAR by air, such that "little" acoustic energy (i.e. "little" relative to the amount of acoustic energy coupled if the resonators were totally in contact) is coupled between the first/lower FBAR and the second/upper FBAR, since standoffs 62' and 64' may be used for acoustic coupling (see col. 4, lines 23-34).

Regarding claims 3, 4 and 10, it should be noted that there appears to be no difference between "standoffs" and the "separator" (see section [0027] with Fig. 5 showing "standoffs" 27 and "separators" 29, and "standoffs" 41b and 41a in Fig. 8 with section [0037]). Therefore, Fig. 6 of Barber et al. also shows the second/upper FBAR supported and separated from the first/lower FBAR by standoffs (i.e. either of 62' or 64') with at least one separator (62' or 64') between the first/lower FBAR and the second/upper FBAR. Regarding claims 6 and 7, a standoff (62' or 64') is fabricated on the first/lower FBAR and connected to the bottom electrode 18' of the second/upper FBAR so as to be between the top electrode 20 of the first/lower FBAR and the bottom

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electrode 18' of the second/upper FBAR. Regarding claim 15, a third FBAR may be added above the second FBAR (see col. 4, lines 36-38).

8. Claims 1-5, 10, 13, 16-19 and 22 are rejected under 35 U.S.C. § 102(b) as being anticipated by Tsai et al. U.S. 2002/0109564.

Regarding claims 1, 2, 5, 13, 16, 18 and 19, Fig. 9 of Tsai et al. discloses an apparatus comprising: a first/lower FBAR that is bottom electrode 90G-2 and top electrode 92 sandwiching piezoelectric layer 90P and formed on a substrate 90S; and a second/ upper FBAR that is bottom electrode 93 and top electrode 90G-2' sandwiching piezoelectric layer 90P', the second/upper FBAR being above the first/lower FBAR; and wherein the second/upper FBAR is vertically and acoustically separated and de-coupled from the first/lower FBAR by air, such that no acoustic energy is coupled between the first/lower FBAR and the second/upper FBAR.

Regarding claims 3, 10, 17 and 22, the second/upper FBAR is supported above and separated from the first/lower FBAR by "standoff" 90T. Regarding claim 4, air is considered to be a "separator" between the upper and lower FBARs since it acoustically separates them.

9. Claims 1, 3, 4, 10, 12, 13, 16 and 17 are rejected under 35 U.S.C. §102(b) as being anticipated by Yamamoto et al. U.S. 5,801,603.

Regarding claims 1, 13 and 16, Figs. 9 and 10 of Yamamoto et al. disclose an apparatus comprising: a first/lower acoustic resonator 26 formed on a substrate 12C; and a second/upper acoustic resonator 24 vertically and acoustically separated and de-

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coupled from the first/lower resonator 26 by air, such that no acoustic energy is coupled between the resonators.

Regarding claims 3, 4, 10, 12 and 17, the second/upper resonator is supported above and separated from the first/lower resonator by "standoffs"/ "separator" (104 and 110)[110 cannot be seen in Fig. 10 but is similar to 112 and on the nodal point of the resonators as shown also in Fig. 2], wherein 110 is a "standoff"/ "separator" between the two resonators that is electrically conductive (see col. 15, lines 11) such that it also serves to electrically connect the resonators via their electrodes 34a and 32b (col. 15, lines 24-29). Regarding claim 4, the air between the resonators at all other locations besides standoff 110, can also be considered the "separator".

### ***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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11. Claim 14 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Barber et al. U.S. 6,635,519 taken alone.

Barber et al. discloses the invention as discussed above, except for explicitly disclosing the distance of separation between the resonators.

It should be noted that Barber et al. does disclose the thickness of the piezoelectric layers as between 1-5 microns (see col. 3, lines 30-33), and discloses an optional cap layer (32 in Fig. 7) that is considered to be "thick" as having a thickness of "several microns" (see col. 4, lines 50-51) thereby giving the general scale of the device.

Consequently, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the apparatus of Barber et al. (Fig. 6) if even necessary, such that the distance between the upper and lower FBARs would have been between 0.1 to 20 microns, because Barber et al. is silent as to the precise distance, thereby suggesting to one of ordinary skill that any thickness in scale with the device would have been usable therewith, and because Barber et al. explicitly gives the scale of the device as having layers with a thickness in the 1-5 micron or "several microns" ranges (see col. 3, lines 30-33 and col. 4, lines 50-51) which would implicitly suggest to one of ordinary skill in the art a distance between the resonators also in the 1-5 micron or "several microns" range.

***Allowable Subject Matter***

12. Claims 8, 9, 11, 20, 21, and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.



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**Conclusion**

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Weber U.S. 5,864,261 discloses (Fig. 5) FBARs 100 and 120 that are vertically separated by standoff layers 140 with only "little" acoustic coupling via plug 150.

Yamamoto U.S. 6,466,107 discloses (Fig. 5) stacked acoustic resonators 61, 71 formed on a substrate 32 that are vertically separated by air but electrically connected by standoffs 68, 81 and terminal 34.

Poirier et al. U.S. 3,568,108; Ella et al. U.S. 6,670,866; Lakin U.S. 6,720,844; and Unterberger U.S. 6,917,261 each disclose stacked FBARs with acoustic coupling.


Krishnaswamy et al. U.S. 5,185,589 also has stacked FBARs (see Fig. 5A) separated by a standoff insulating layer 53, but this apparatus acts like a stacked filter (see col. 4, lines 14-18), and so has acoustic coupling between the resonators.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barbara Summons whose telephone number is (571) 272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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August 18, 2005



**BARBARA SUMMONS  
PRIMARY EXAMINER**